Unit 1 3
Day 5
Inverse Functions - continued

Let f be a one-to-one function. Then g is the inverse function of f if

$(f \circ g)(x) = x$ for every x in the domain of g.

$(g \circ f)(x) = x$ for every x in the domain of f.

Determine if the functions are inverses.

1) $f(x) = x^3 - 2$ $\quad g(x) = \sqrt[3]{x+2}$

$f \circ g = f(g(x)) = f(\sqrt[3]{x+2}) = (\sqrt[3]{x+2})^3 - 2 = x+2-2 = x$ ✓

$g \circ f = \sqrt[3]{(x^3-2)+2} = \sqrt[3]{x^3} = x$ ✓

$f(x) = x^3 - 2$

$x = y^3 - 2$

$x+2 = y^3$

$\sqrt[3]{x+2} = y$

$g(x) = \sqrt[3]{x+2}$

$x = \sqrt[3]{y+2}$

$x^3 = y+2$

$x^3 - 2 = y$

yep, they are inverse

Determine if the functions are inverses.

2) $f(x)=\sqrt{\frac{1}{3}x+\frac{4}{3}}$ $g(x)=3x^2-4$

$f\circ g=\sqrt{\frac{1}{3}(3x^2-4)+\frac{4}{3}}$

$=\sqrt{x^2-\frac{4}{3}+\frac{4}{3}}$

$=\sqrt{x^2}$ ✓

$=x$

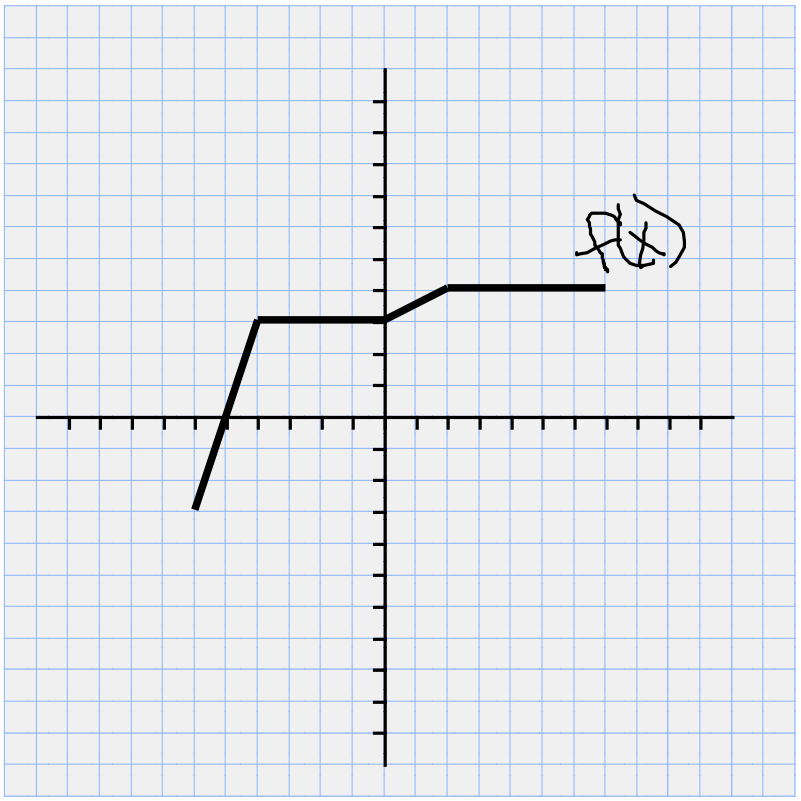
$g\circ f=3\left(\sqrt{\frac{1}{3}x+\frac{4}{3}}\right)^2-4$

$=3\left(\frac{1}{3}x+\frac{4}{3}\right)-4$

$=x+4-4$ ✓

$=x$

Use the graph of to find each value.



1) $f^{-1}(-3) = -6$

2) $f^{-1}(2) = -4.2$

HOMEWORK

p. 354-7: 1-12 (all),
36-44 (even),
45-56 (all),
72, 74

① $f(x) = \begin{cases} 3x & \text{if } x < 0 \\ 2x-5 & \text{if } x \geq 0 \end{cases}$ $g(x) = \begin{cases} x+3 & \text{if } x \geq 1 \\ 5x & \text{if } x < 1 \end{cases}$ gof

$x < 0$
$0 \leq x < 1$
$x \geq 1$

$g(x) = \begin{cases} 5x & x < 0 \\ 5x & 0 \leq x < 1 \\ x+3 & x \geq 1 \end{cases}$

$g(f(x)) = \begin{cases} 5(3x) & x < 0 \\ 5(2x-5) & 0 \leq x < 1 \\ 2x-5+3 & x \geq 1 \end{cases}$ $gof = \begin{cases} 15x & x < 0 \\ 10x-25 & 0 \leq x < 1 \\ 2x-2 & x \geq 1 \end{cases}$

$g \circ F$

② $f(x) = \begin{cases} 2x & \text{if } x < 0 \\ 3x-5 & \text{if } x \geq 0 \end{cases}$ $g(x) = \begin{cases} x+4 & x \geq 1 \\ 4x & x < 1 \end{cases}$

$x < 0$

$0 \leq x < 1$

$x \geq 1$

$g(x) = \begin{cases} 4y & x < 0 \\ 4x & 0 \leq x < 1 \\ x+4 & x \geq 1 \end{cases}$

$g(f(x)) = \begin{cases} 4(2x) & x < 0 \\ 4(3x-5) & 0 \leq x < 1 \\ (3x-5)+4 & x \geq 1 \end{cases} = \begin{cases} 8x & x < 0 \\ 12x-20 & 0 \leq x \leq 1 \\ 3x+1 & x \geq 1 \end{cases}$